

SMALL ROBOTS WITH STRATEGIC EFFECTS

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- ▶ “Surveillance and counter-surveillance will become the major combat form on the ground battlefield in the future. Equipped with a large number of autonomous unmanned combat vehicles and a variety of small robots, and supported by unmanned logistics support vehicles, the light infantry troops will become the tentacles of the army on the battlefield. They will reach the regions deeply behind the front line occupied by enemy before the fire attack start, and steal into every corner of the battlefield to find all kinds of hidden enemy, to monitor important objects and to provide guidance for fire attack.”

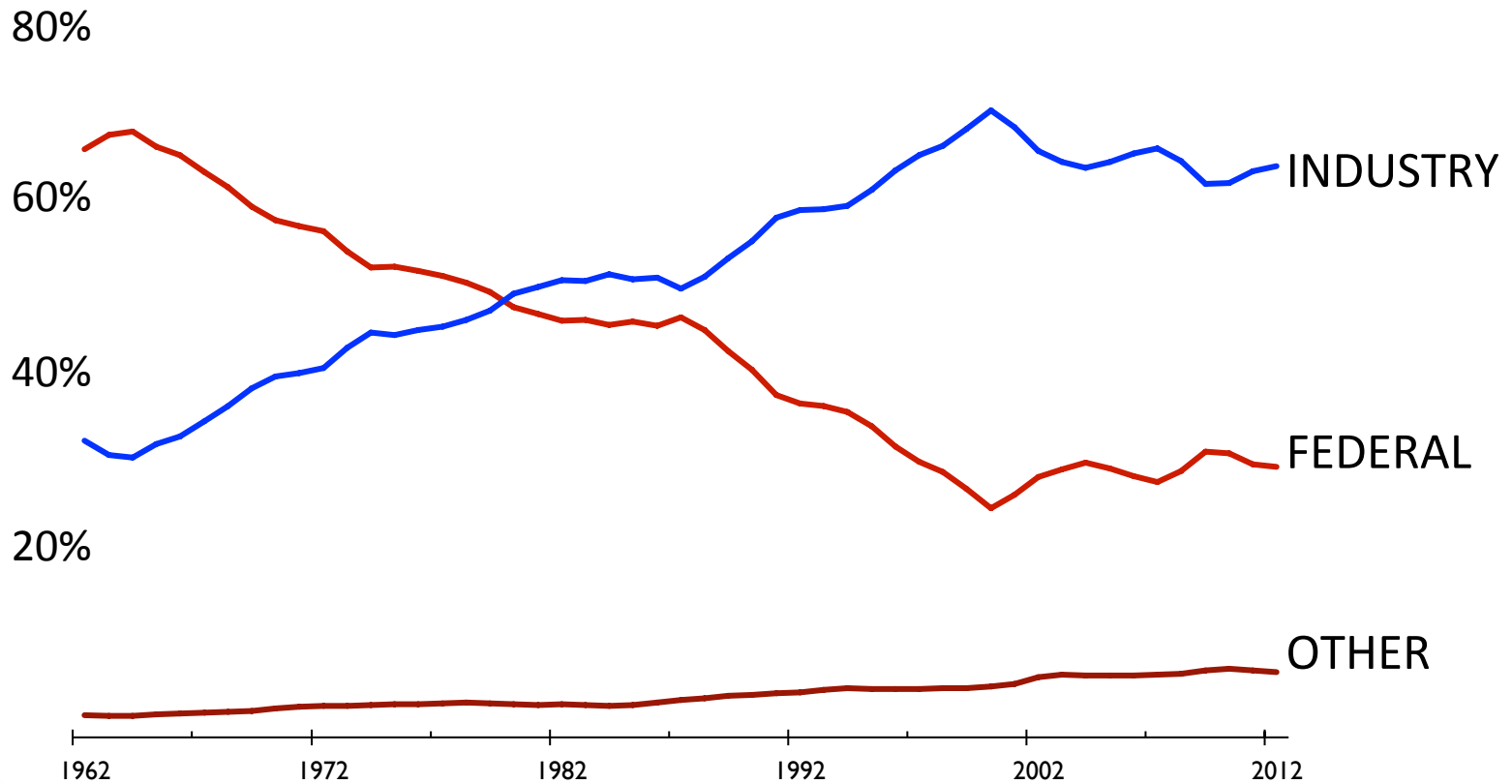
- ▶ Liu Xin and Dai Bin, "The latest status and development trends of military unmanned ground vehicles," *The Institute of Electrical and Electronics Engineers, Inc. (IEEE)*, Conference Proceedings (November 2013): 537.

THE BIG IDEA

- ▶ There are three areas where the military should leverage the commercial sector to be more lethal and effective
 - ▶ Tactical UGVs and UAVs
 - ▶ Augmented (Mixed) Reality human interface
 - ▶ Pre-enlistment robotic/STEM education programs

FOLLOW THE MONEY

Proportion of national R&D coming from the public, private, and non-profit sectors



THE FOUR TRENDS

- ▶ Robotic proliferation and state actors
- ▶ Department of Defense “Third Offset Strategy”
- ▶ The future threat
- ▶ Urban population growth

- ▶ “Regarding UGVs, there has been fewer, but still important, strides in this field compared with UASs. Several nations, including Israel, have important niche advantages over the U.S. Army, such as armed UGVs that are used for surveillance and patrolling. Japan is currently the world leader in humanoid, bipedal robots that are coming increasingly close to having human-like mobility.”

John Gordon IV, John Matsumura, Anthony Adler, Scott Boston, Matthew E Boyer, Natasha Lander and Todd Nichols, "Comparing US Army Systems with Foreign Counterparts," RAND Research Report, (2015). xviii.



- ▶ “The U.S. military has been investing in UASs and unmanned ground vehicles (UGVs) for the last few decades. The fighting in Iraq and Afghanistan dramatically accelerated that trend. While the United States and Israel have been at the forefront of tactical-level UASs, there is a relatively low cost of entry into the unmanned systems market, making it ripe for additional foreign competition. South Korea, for example, has developed an automated sentry that is employed along the Demilitarized Zone (DMZ) with North Korea. Iran and China are also rapidly moving into the UAS market.”

John Gordon IV, John Matsumura, Anthony Atler, Scott Boston, Matthew E Boyer, Natasha Lander and Todd Nichols, "Comparing US Army Systems with Foreign Counterparts," RAND Research Report, (2015): xviii.



- ▶ “All the major players—Facebook, Google, Apple, Amazon, Microsoft, Sony, Samsung—have whole groups dedicated to artificial reality, and they’re hiring more engineers daily.”

<http://www.wired.com/2016/04/magic-leap-vr/>

AUGMENTED AND MIXED REALITY

Augmented
Reality

Mixed
Reality

Virtual
Reality

Augments the real world with helpful information



How it's done

Blends holograms with your real world



How it's done

Can transport you to a virtual world



How it's done



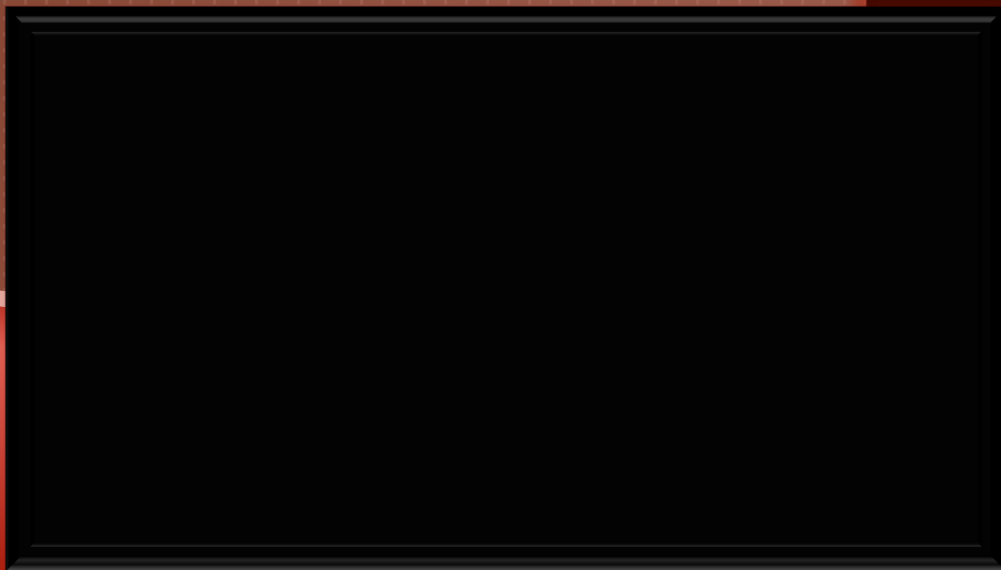
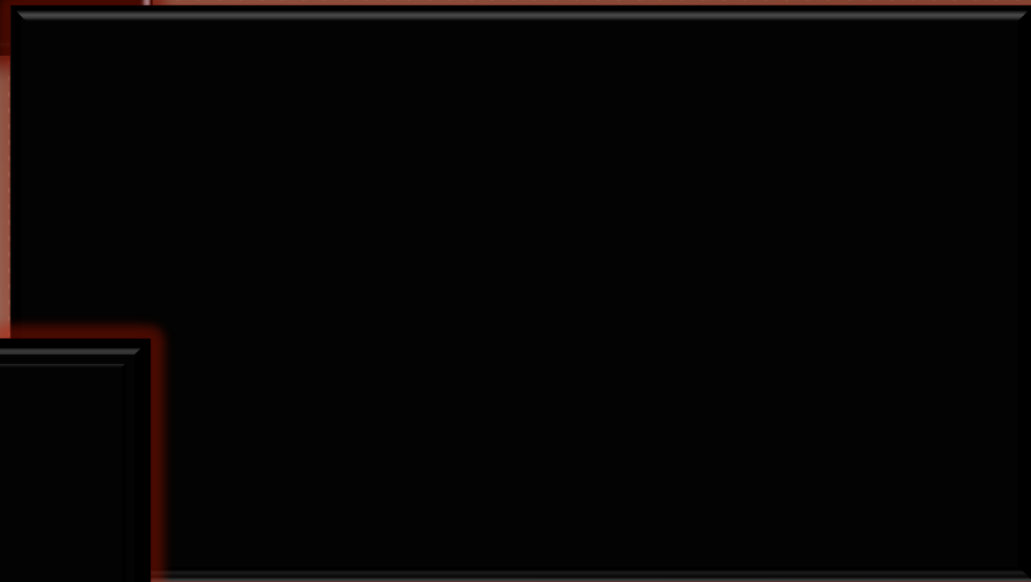
Replaces the real world







Microsoft HoloLens





FIRST

BY THE NUMBERS



233,000+
PARTICIPANTS



29,000
TEAMS



29,000
ROBOTS

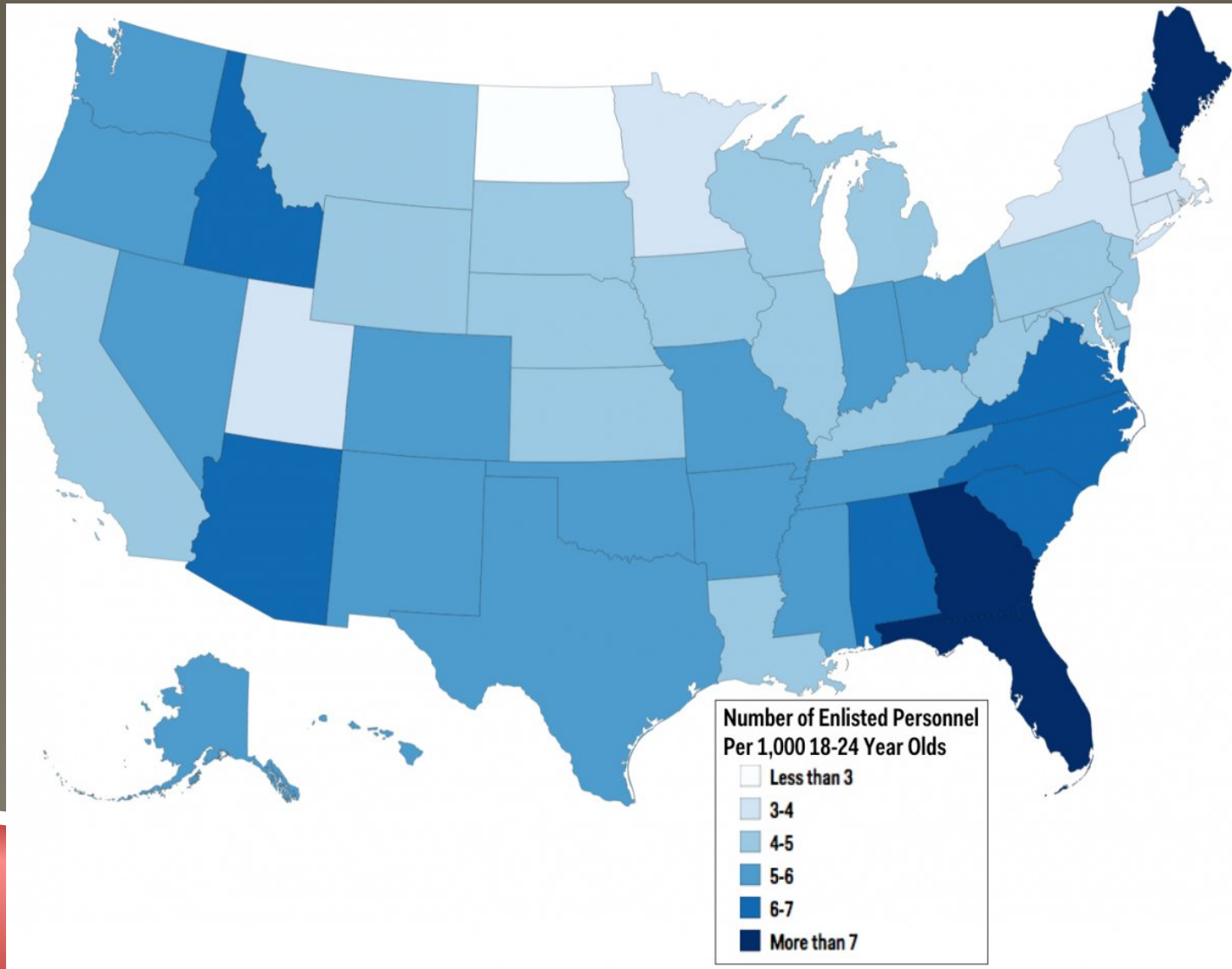


1,350
EVENTS



80
COUNTRIES

MILITARY RECRUITS BY STATE - 2013



CONCLUSION AND RECOMMENDATIONS

- ▶ Identify commercial UGVs and UAVs for more rapid fielding, employment, and innovation at the unit level
- ▶ Rapidly incorporate “Mixed Reality” technology – best of breed = Microsoft Hololens
- ▶ Larger study of early education STEM and robotic programs – then invest at locations with the majority of US military recruits

QUESTIONS?

▶ “Like [the] tank in 20th century, military UGV will become the main weapon of the Army in 21st century. Compared to the manned armored vehicles, many advantages of UGV, such as larger combat radius, lower weight, higher mobility, longer duration, high self-sustaining capacity, etc., have been appeared now. Military UGV should become an important aspect of the weapon development plan to improve the combat capability of the Army in the future.”

▶ Liu Xin and Dai Bin, "The latest status and development trends of military unmanned ground vehicles," 537.